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FUNGI AND VIRUSES

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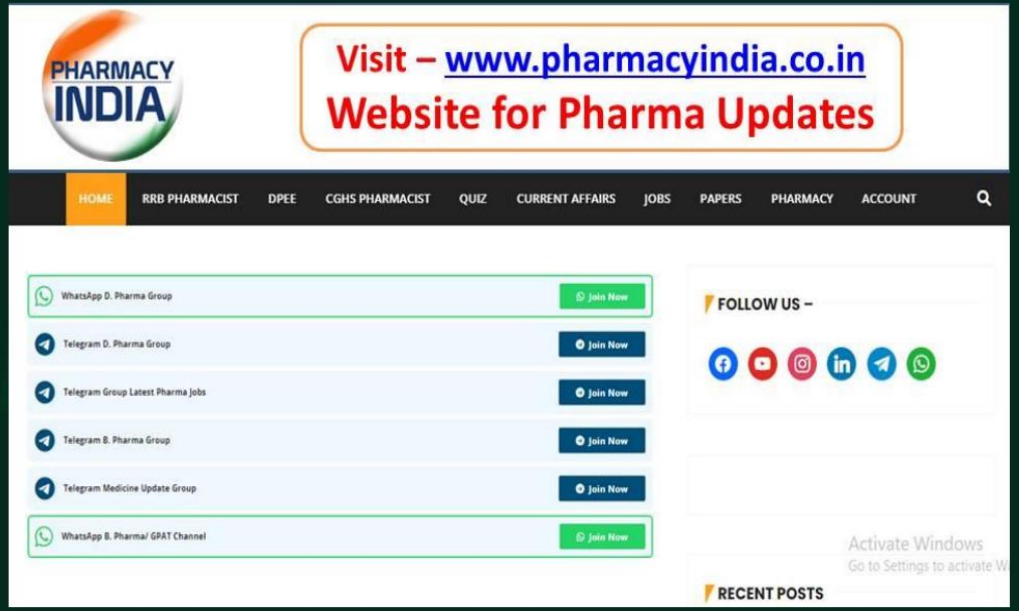

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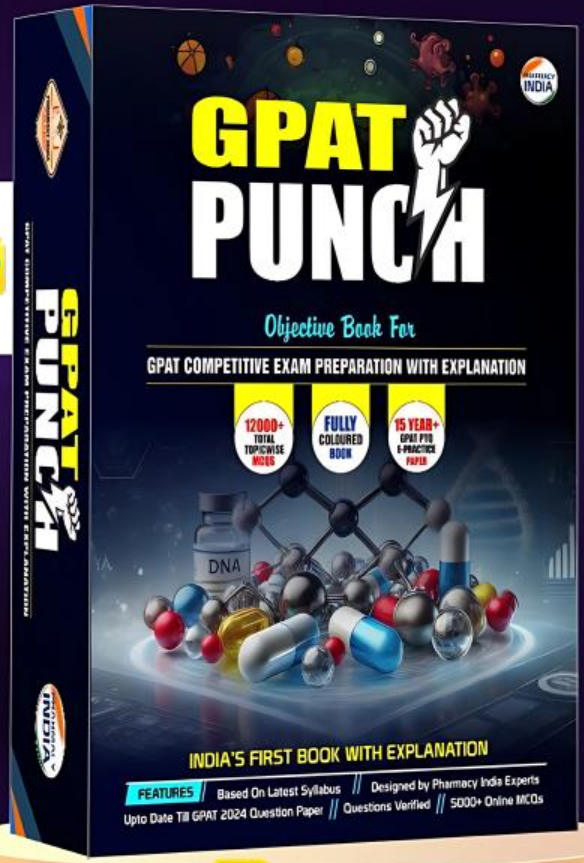

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FUNGI AND VIRUSES

1. **Which of the following is the best technique for detecting HIV? [GPAT-2024]**

(a) Widal test
(b) Polymerase chain reaction
(c) Reverse transcriptase-PCR
(d) Real-time PCR

1. **Which of the following is the best technique for detecting HIV? [GPAT-2024]**

(a) Widal test

(b) Polymerase chain reaction

(c) Reverse transcriptase-PCR

(d) Real-time PCR

- **Explanation:**
- **HIV (Human Immunodeficiency Virus)** detection is crucial for diagnosing AIDS. It involves identifying either the viral RNA or antibodies produced against the virus in the patient's blood.
- **Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR):**
  - This is a highly **sensitive and specific molecular technique** used for detecting RNA viruses like HIV.
  - HIV is an **RNA virus**, and RT-PCR converts the RNA into complementary DNA (cDNA) using the enzyme **reverse transcriptase**. This cDNA is then amplified using PCR to detect the presence of viral RNA.

- RT-PCR is considered the **gold standard** for detecting HIV in the early stages of infection, especially before the antibodies are detectable by other tests like ELISA.

- Other tests:
  - **Widal test (a)** is used for diagnosing typhoid fever, not HIV.
  - **Polymerase chain reaction (b)** is a technique for amplifying DNA but does not include reverse transcription, making it unsuitable for RNA viruses.
  - **Real-time PCR (d)** can be used in combination with RT-PCR for quantification but is not typically the sole method for detecting HIV.

Reference:

Kuby Immunology, 8th Edition, Page 492; Molecular Biology of the Cell by Alberts et al., 6th Edition, Page 1406.

2. **Influenza viruses are RNA viruses and belong to which family? [GPAT-2024]**

(a) Orthomyxoviridae
(b) Retroviridae
(c) Papovaviridae
(d) Parvoviridae

2. **Influenza viruses are RNA viruses and belong to which family? [GPAT-2024]**

(a) Orthomyxoviridae

(b) Retroviridae

(c) Papovaviridae

(d) Parvoviridae

- **Explanation**:
- **Influenza viruses** are single-stranded RNA viruses that cause **influenza (flu)** in humans and animals.
- They belong to the **Orthomyxoviridae family**, which is further divided into types **A, B, and C**, based on their core proteins. Type A viruses are the most common and cause pandemics.
- **Characteristics of Orthomyxoviridae:**
  - Genome: **Segmented, negative-sense single-stranded RNA**.
  - Enveloped virus: Contains an outer lipid bilayer derived from the host cell membrane.

- Glycoproteins on the surface include **hemagglutinin (HA)** and **neuraminidase (NA)**, which are responsible for attachment and release from host cells.
- Replication occurs in the **nucleus**, which is unusual for RNA viruses.

- **Incorrect options:**
  - **Retroviridae (b):** Includes HIV; these are RNA viruses but replicate through a DNA intermediate.
  - **Papovaviridae (c):** Includes DNA viruses like papillomavirus.
  - **Parvoviridae (d):** Small, non-enveloped DNA viruses like parvovirus.

Reference:

Medical Microbiology by Murray et al., 8th Edition, Page 481.

3. **Which of the following is acellular? [GPAT-2023 SHIFT-II]**

(a) Bacteria

(b) Fungus

(c) Virus

(d) Amoeba

3. **Which of the following is acellular? [GPAT-2023 SHIFT-II]**

(a) Bacteria

(b) Fungus

(c) Virus

(d) Amoeba

- **Explanation:**
- A **virus** is considered **acellular**, meaning it is not made up of cells. Instead, it is a **non-living infectious particle** consisting of:
  - **Genetic material (DNA or RNA),** which carries the instructions for replication.
  - A **protein coat (capsid)** that protects the genetic material.
  - Some viruses have an additional lipid envelope derived from the host cell membrane.
- Viruses are **obligate intracellular parasites**, meaning they cannot reproduce outside a host cell.

- **Incorrect options:**
  - **Bacteria (a):** Prokaryotic, unicellular organisms.
  - **Fungus (b):** Eukaryotic, multicellular or unicellular organisms (e.g., yeast).
  - **Amoeba (d):** Unicellular, eukaryotic protozoan.

Reference:

Medical Microbiology by Jawetz et al., 28th Edition, Page 244.

4. **This fungus is also known as an opportunistic pathogen, often isolated from warm-blooded animals. [GPAT-2020]**

(a) Aspergillus niger
(b) Penicillium notatum
(c) Penicillium chrysogenum
(d) Candida albicans

4. **This fungus is also known as an opportunistic pathogen, often isolated from warm-blooded animals. [GPAT-2020]**

(a) Aspergillus niger

(b) Penicillium notatum

(c) Penicillium chrysogenum

(d) Candida albicans

- **Explanation:**
- **Candida albicans** is a **dimorphic fungus**, meaning it can exist in both yeast and filamentous forms depending on environmental conditions.
- It is an **opportunistic pathogen**, commonly found in the normal flora of the human gastrointestinal tract, mouth, and vagina.
- It causes infections (candidiasis) under immunocompromised conditions, such as in:
  - **HIV/AIDS patients**
  - **Diabetic individuals**
  - **Patients undergoing prolonged antibiotic therapy**

- Common infections caused:
  - **Oral thrush** (white patches in the mouth)
  - **Vaginal candidiasis** (yeast infection)
  - **Systemic candidiasis** in severe cases, which can be life-threatening.

Incorrect Options:

- **Aspergillus niger (a):** Causes aspergillosis, primarily in immunocompromised individuals.
- **Penicillium notatum (b)** and **Penicillium chrysogenum (c):** Non-pathogenic fungi, primarily known for the production of antibiotics like penicillin.

Reference:

Medical Microbiology by Jawetz et al., 28th Edition, Page 684.

5. **Which of the following are obligatory intracellular parasites? [GPAT-2018]**

[P] Virus

[Q] Fungus

[R] Mycobacterium

[S] Rickettsia

(a) [P], [Q], [R] and [S]

(b) [P], [Q] and [R]

(c) [R] and [S]

(d) [P] and [S]

5. Which of the following are obligatory intracellular parasites? [GPAT-2018]

[P] Virus
[Q] Fungus
[R] Mycobacterium
[S] Rickettsia

(a) [P], [Q], [R] and [S]
(b) [P], [Q] and [R]
(c) [R] and [S]
(d) [P] and [S]

- **Explanation:**
- **Obligatory intracellular parasites** are organisms that can only survive and multiply inside a host cell.
- **Viruses (P):**
  - Completely dependent on host cells for replication as they lack cellular machinery for energy production or protein synthesis.
- **Rickettsia (S):**
  - A genus of bacteria that requires a host cell for survival.
  - Causes diseases like **Rocky Mountain spotted fever** and **typhus**.

Incorrect Options:

- **Fungi (Q):** Typically not intracellular parasites; they are free-living organisms.
- **Mycobacterium (R):** Includes species like Mycobacterium tuberculosis, which can survive intracellularly but is not an obligatory intracellular parasite.

Reference:

Microbiology by Pelczar et al., 7th Edition, Page 575.

6. **Which of the following about the Varicella-Zoster Virus (VZV) is NOT true? [GPAT-2018]**

(a) Varicella develops after an individual is exposed to VZV for the first time

(b) Herpes zoster develops from reactivation of the virus later in life

(c) There are no vaccines for this virus

(d) The infection results in post-herpetic neuralgia

6. **Which of the following about the Varicella-Zoster Virus (VZV) is NOT true? [GPAT-2018]**

(a) Varicella develops after an individual is exposed to VZV for the first time

(b) Herpes zoster develops from reactivation of the virus later in life

(c) There are no vaccines for this virus

(d) The infection results in post-herpetic neuralgia

- **Explanation:**
- The **Varicella-Zoster Virus (VZV)** is a member of the **Herpesviridae family** and causes two distinct clinical diseases:
  - **Varicella (chickenpox):** Occurs on initial infection.
  - **Herpes zoster (shingles):** Results from the reactivation of latent VZV in sensory nerve ganglia.
- **True Statements:**
  - **(a):** Varicella develops on first exposure.
  - **(b):** Herpes zoster is a result of reactivation, usually during immunosuppression or old age.

- **(d):** Post-herpetic neuralgia is a common complication of shingles, causing chronic pain even after the lesions heal.

- **False Statement:**
  - **(c):** Vaccines are available. The **Varicella vaccine** is given for chickenpox, and the **Zoster vaccine** is available to prevent shingles in older adults.

Reference:

Medical Microbiology by Jawetz et al., 28th Edition, Page 452.

7. **Which of the following is NOT true about the Ebola Virus Disease (EVD)? [GPAT-2018]**

(a) Spreads through human-to-human transmission via direct contact

(b) Antiviral drugs are approved by FDA to mitigate the infection

(c) Diagnostic tests include ELISA

(d) The virus is named after a river

7. **Which of the following is NOT true about the Ebola Virus Disease (EVD)? [GPAT-2018]**

(a) Spreads through human-to-human transmission via direct contact

(b) Antiviral drugs are approved by FDA to mitigate the infection

(c) Diagnostic tests include ELISA

(d) The virus is named after a river

- **Explanation:**
- **Ebola Virus Disease (EVD):**
  - A severe, often fatal illness caused by the **Ebola virus**, a member of the **Filoviridae family**.
  - It spreads through **direct contact** with infected body fluids (e.g., blood, saliva, urine) or contaminated surfaces.
  - The disease is highly contagious, particularly during the late stages or after the patient's death.

True Statements:

- **(a):** EVD spreads via human-to-human transmission through direct contact.

- **(c):** Diagnostic tests such as **ELISA (enzyme-linked immunosorbent assay)** are used to detect the virus or antibodies.
- **(d):** The Ebola virus was first identified near the **Ebola River** in the Democratic Republic of Congo in 1976.

False Statement:

- **(b):** Currently, there are **no FDA-approved antiviral drugs** for treating Ebola. Management primarily involves **supportive care**, such as hydration, electrolyte balance, and oxygen therapy. However, experimental treatments like **monoclonal antibodies** (e.g., Inmazeb, Ebanga) are used.

Reference:

Principles of Virology by Flint et al., 4th Edition, Page 824.

8. **Rubella virus is associated with disease. [GPAT-2017]**

(a) Progressive encephalitis

(b) Enterovirus infection

(c) Yellow fever

(d) Brucellosis

8. **Rubella virus is associated with disease. [GPAT-2017]**

(a) Progressive encephalitis

(b) Enterovirus infection

(c) Yellow fever

(d) Brucellosis

- **Explanation**:
- **Rubella virus**:
  - Belongs to the **Togaviridae family** and is the causative agent of **Rubella** (German measles).
  - It is an RNA virus that spreads via **respiratory droplets**.
  - Though Rubella itself is a mild disease, it can cause severe complications in congenital infections, such as **congenital rubella syndrome (CRS)**.

- **Progressive encephalitis:**
  - Rare neurological complication associated with the virus, primarily affecting immunocompromised individuals.

Incorrect Options:

- **(b) Enterovirus infection:** Caused by Enteroviruses like Coxsackievirus or Poliovirus.
- **(c) Yellow fever:** Caused by **Flavivirus**, not Rubella virus.
- **(d) Brucellosis:** Caused by **Brucella species**, a bacterial pathogen.

Reference:

Medical Microbiology by Murray et al., 8th Edition, Page 324.

9. Herpes viruses are large encapsulated viruses that have double-stranded DNA genome that encodes approximately 70 proteins. It causes acute infection followed by latent infection in which viruses persist in noninfectious form with periodic reactivation and shedding of infectious virus. Following are the examples of such herpes virus-EXCEPT. [GPAT-2017]

[P] Epstein-Barr Virus
[Q] Herpes simplex
[R] Varicella Zoster
[S] Cytomegalovirus

(a) [Q] Only
(b) [Q] and [R]
(c) [P], [Q], and [R]
(d) [P], [Q], [R], and [S]

9. Herpes viruses are large encapsulated viruses that have double-stranded DNA genome that encodes approximately 70 proteins. It causes acute infection followed by latent infection in which viruses persist in noninfectious form with periodic reactivation and shedding of infectious virus. Following are the examples of such herpes virus-EXCEPT. [GPAT-2017]

[P] Epstein-Barr Virus
[Q] Herpes simplex
[R] Varicella Zoster
[S] Cytomegalovirus

(a) [Q] Only
(b) [Q] and [R]
(c) [P], [Q], and [R]
(d) [P], [Q], [R], and [S]

- **Explanation:**
- **Herpesviruses** are double-stranded DNA viruses known for causing acute infections followed by latency. Examples of herpesviruses include:
  - **[P] Epstein-Barr Virus (EBV):** Causes infectious mononucleosis and is associated with some cancers.
  - **[Q] Herpes simplex virus (HSV):** Includes HSV-1 and HSV-2, causing oral and genital herpes.
  - **[R] Varicella Zoster Virus (VZV):** Causes chickenpox and reactivates as shingles.

- **[S] Cytomegalovirus (CMV):** Typically asymptomatic but can cause severe disease in immunocompromised individuals.

All the options—[P], [Q], [R], and [S]—are herpesviruses capable of **acute infection**, **latency**, and **reactivation**, aligning with the characteristics described in the question.

Reference:

Medical Microbiology by Jawetz et al., 28th Edition, Page 532.

10. **Viroids differ from viruses in [GPAT-2015]**

(a) Naked DNA molecules

(b) Satellite RNA packaged with viral genome

(c) Naked RNA molecules only

(d) Naked DNA packaged with viral genome

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(a) Naked DNA molecules

(b) Satellite RNA packaged with viral genome

(c) Naked RNA molecules only

(d) Naked DNA packaged with viral genome

- **Explanation**:
- **Viroids**:
  - Small, circular, **single-stranded RNA molecules** that do not code for proteins and lack a protective protein coat (capsid).
  - They are infectious agents causing plant diseases (e.g., **potato spindle tuber disease**).
  - Unlike viruses, viroids are **naked RNA molecules**, meaning they are not enclosed in a capsid or associated with a viral genome.

Viruses:

- Consist of DNA or RNA enclosed in a protein coat (capsid) and sometimes an additional lipid envelope. They infect animals, plants, and microorganisms.

Incorrect Options:

- **(a) Naked DNA molecules:** Viroids contain RNA, not DNA.
- **(b) Satellite RNA:** Refers to RNA molecules that depend on helper viruses for replication.
- **(d) Naked DNA packaged with viral genome:** Irrelevant to viroids.

Reference:

Biology of Microorganisms by Brock et al., 14th Edition, Page 654.

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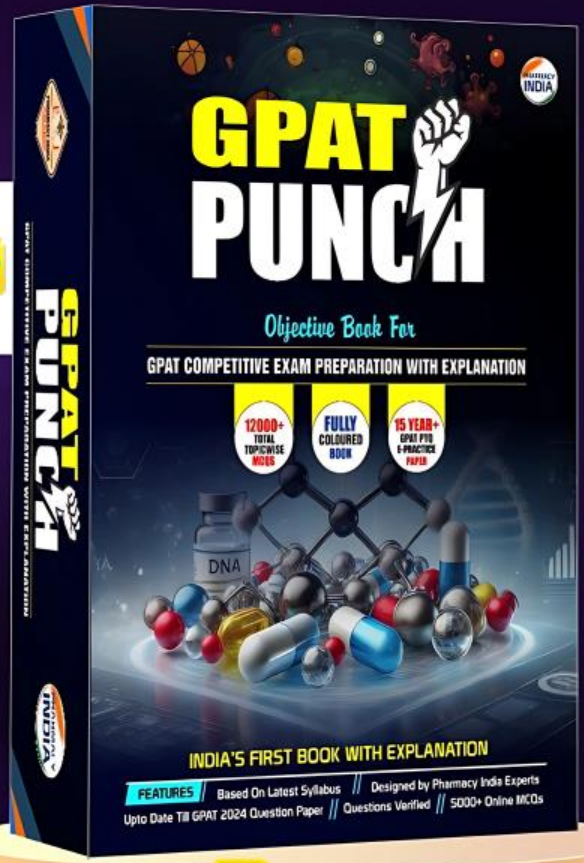

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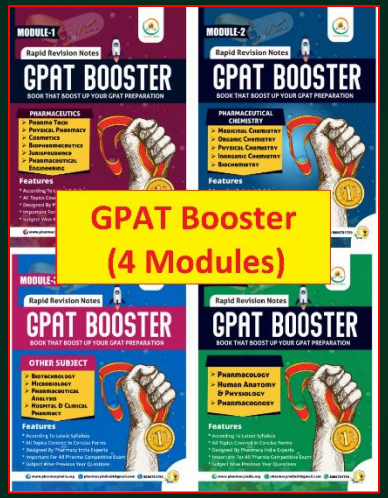

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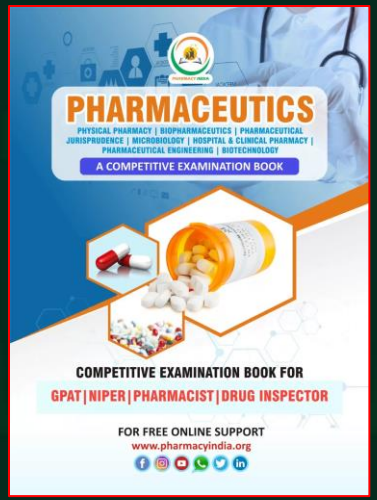

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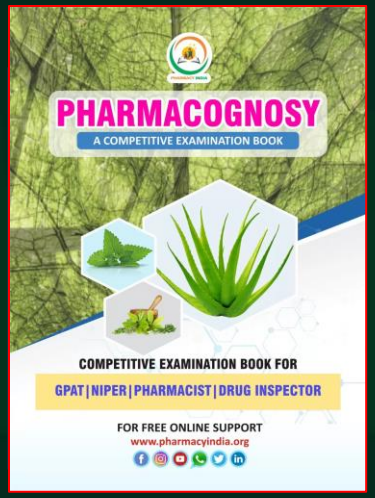

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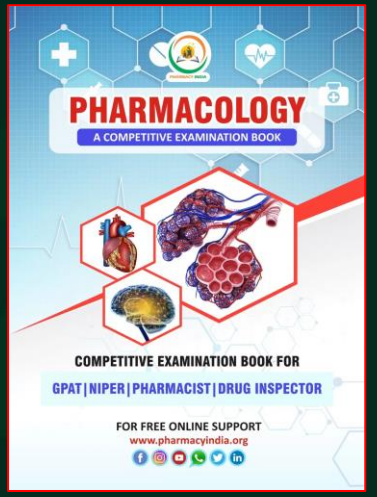

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11.

Match the following [GATE-2009]

Group I (Microorganisms)	Group II (Typical Characteristics)
1. Corynebacterium diphtheriae	[Q]: Cells lined side by side like matchsticks and at angles to one another
2. Streptococcus pyogenes	[S]: Cells divide in one plane and remain attached to form chains
3. Staphylococcus aureus	[P]: Cells divide in three planes in an irregular pattern, producing 'bunches'
4. Streptomyces violodromogenes	[R]: Long, branched, multinuclear filaments called 'hyphae'

(a) 1-[R], 2-[S], 3-[Q], 4-[P]
(b) 1-[S], 2-[P], 3-[Q], 4-[R]
(c) 1-[Q], 2-[S], 3-[P], 4-[R]
(d) 1-[R], 2-[Q], 3-[P], 4-[S]

11.

Match the following [GATE-2009]

Group I (Microorganisms)	Group II (Typical Characteristics)
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(a) 1-[R], 2-[S], 3-[Q], 4-[P]

(b) 1-[S], 2-[P], 3-[Q], 4-[R]

(c) 1-[Q], 2-[S], 3-[P], 4-[R]

(d) 1-[R], 2-[Q], 3-[P], 4-[S]

- **Explanation:**

Microorganism	Matching Characteristic	Explanation
1. Corynebacterium diphtheriae	[Q]: Cells lined side by side like matchsticks	Arranged in a palisade arrangement resembling matchsticks, typical for gram-positive bacteria.
2. Streptococcus pyogenes	[S]: Cells divide in one plane and form chains	Causes pharyngitis; forms chains of cells due to division in a single plane.
3. Staphylococcus aureus	[P]: Cells divide in three planes forming irregular bunches	Known for grape-like clusters, as division occurs in multiple planes.
4. Streptomyces violodromogenes	[R]: Long, branched, multinuclear filaments called 'hyphae'	Filamentous bacteria resembling fungi; produces secondary metabolites like antibiotics.

- **Reference:** Medical Microbiology by Jawetz et al., 28th Edition, Page 45.

12. **The virus responsible for SARS can be described by two of the following features. [GATE-2008]**

Statements:

[P] It contains double-stranded DNA and requires two complementary strands to be synthesized to serve as mRNA.

[Q] It has distinctive club-shaped particles projecting from the surface, appearing like a crown.

[R] It contains plus-strand RNA that can serve directly as mRNA.

[S] It is a retrovirus and requires extracellular DNA for replication.

(a) [P], [Q]

(b) [P], [S]

(c) [Q], [R]

(d) [R], [S]

12. **The virus responsible for SARS can be described by two of the following features. [GATE-2008]**

Statements:

[P] It contains double-stranded DNA and requires two complementary strands to be synthesized to serve as mRNA.

[Q] It has distinctive club-shaped particles projecting from the surface, appearing like a crown.

[R] It contains plus-strand RNA that can serve directly as mRNA.

[S] It is a retrovirus and requires extracellular DNA for replication.

(a) [P], [Q]

(b) [P], [S]

(c) [Q], [R]

(d) [R], [S]

- **Explanation:**
- The **Severe Acute Respiratory Syndrome (SARS)** virus belongs to the **Coronaviridae family**:
  - **[Q]:** The virus particles have a crown-like appearance due to club-shaped spike proteins projecting from their surface.
  - **[R]:** It is a **positive-sense single-stranded RNA virus**, meaning its genome can directly function as mRNA.
- **Incorrect Statements:**
  - **[P]:** SARS-CoV is not a double-stranded DNA virus; it is RNA-based.
  - **[S]:** SARS-CoV is not a retrovirus and does not rely on extracellular DNA.

Reference: Virology by Flint et al., 4th Edition, Page 432.

13. **Varicella zoster is the causative organism for [GATE-2001]**

(a) Smallpox
(b) Dermatophytosis
(c) Herpes
(d) Infectious mononucleosis

13. **Varicella zoster is the causative organism for [GATE-2001]**

(a) Smallpox

(b) Dermatophytosis

(c) Herpes

(d) Infectious mononucleosis

- **Explanation:**
- **Varicella-Zoster Virus (VZV):**
  - A member of the **Herpesviridae family**, it causes:
    - **Varicella (chickenpox)** upon primary infection.
    - **Herpes zoster (shingles)** upon reactivation of the virus in sensory ganglia later in life.
- **Incorrect Options:**
  - **(a) Smallpox:** Caused by the Variola virus (Poxviridae family).
  - **(b) Dermatophytosis:** A fungal infection caused by dermatophytes like Trichophyton.
  - **(d) Infectious mononucleosis:** Caused by Epstein-Barr virus (also a Herpesviridae member but not VZV).

Reference: Medical Microbiology by Jawetz et al., 28th Edition, Page 453.

14. **Match the following diseases with their causative organisms. [GATE-2000]**

Diseases	Causative Organisms
1. Helminthiasis	[P] Plasmodium falciparum
2. Jaundice	[Q] Taenia solium
	[R] Hepatitis-A Virus
	[S] Toxoplasma gondii

(a) 1-[Q], 2-[R]
(b) 1-[R], 2-[S]
(c) 1-[R], 2-[P]
(d) 1-[P], 2-[S]

14. **Match the following diseases with their causative organisms. [GATE-2000]**

Diseases	Causative Organisms
1. Helminthiasis	[P] Plasmodium falciparum
2. Jaundice	[Q] Taenia solium
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	[S] Toxoplasma gondii

(a) 1-[Q], 2-[R]

(b) 1-[R], 2-[S]

(c) 1-[R], 2-[P]

(d) 1-[P], 2-[S]

- **Explanation:**

Disease	Causative Organism	Explanation
1. Helminthiasis	[Q] Taenia solium	Caused by parasitic worms (helminths) such as tapeworms (e.g., Taenia solium) and roundworms.
2. Jaundice	[R] Hepatitis-A Virus	A viral infection caused by Hepatitis A virus, leading to liver inflammation and yellowing of the skin.

Incorrect Options:

- **Plasmodium falciparum (P):** Causes malaria, not helminthiasis or jaundice.
- **Toxoplasma gondii (S):** Causes toxoplasmosis, often affecting immunocompromised individuals, unrelated to these conditions.

Reference:

Parasitology by Chatterjee, 14th Edition, Pages 155–160.

15. **Among the following statements, one of them is most appropriate for γ-Interferon. Identify. [GATE-1998]**

(a) They are virus-specific substances and host-specific, naturally occurring glycoproteins
(b) They are not virus-specific substances, however, they are naturally occurring glycoproteins
(c) They are not virus-specific substances, however, they are not host-specific either. They are naturally occurring glycoproteins
(d) They are virus-specific and host-specific naturally occurring glycoproteins

15. **Among the following statements, one of them is most appropriate for γ-Interferon. Identify. [GATE-1998]**

(a) They are virus-specific substances and host-specific, naturally occurring glycoproteins

(b) They are not virus-specific substances, however, they are naturally occurring glycoproteins

(c) They are not virus-specific substances, however, they are not host-specific either. They are naturally occurring glycoproteins

(d) They are virus-specific and host-specific naturally occurring glycoproteins

- **Explanation:**
- **γ-Interferon (IFN-γ):**
  - A type of cytokine secreted by **T-helper cells and natural killer cells.**
  - Plays a key role in **immune response** by activating macrophages and enhancing antigen presentation.
  - It is a **naturally occurring glycoprotein**, but it is **not virus-specific**, as it is effective against a variety of pathogens, including bacteria and fungi.
- **Incorrect Options:**
  - **(a), (d):** IFN-γ is not virus-specific; it has a broader function in immunity.
  - **(c):** IFN-γ is host-specific, as it functions in human and other mammalian immune responses.

Reference: Immunology by Kuby, 8th Edition, Page 234.

16. Which one of the following is called as the 'brewer's yeast'?

(a) Saccharomyces ludwigii
(b) Saccharomyces cerevisiae
(c) Saccharomyces boulardii
(d) Saccharomyces pastorianus

16. Which one of the following is called as the 'brewer's yeast'?

(a) Saccharomyces ludwigii

(b) Saccharomyces cerevisiae

(c) Saccharomyces boulardii

(d) Saccharomyces pastorianus

Explanation:

- **Saccharomyces cerevisiae:**
  - Known as **brewer's yeast** because it is used in **fermentation** to produce **beer, wine, and bread.**
  - It is a eukaryotic, unicellular fungus capable of converting sugars into alcohol and carbon dioxide.
- **Incorrect Options:**
  - **Saccharomyces ludwigii (a):** Used in the brewing of low-alcohol beers.
  - **Saccharomyces boulardii (c):** A probiotic yeast used in treating diarrhea.
  - **Saccharomyces pastorianus (d):** Used in lager beer production.

Reference: Microbiology by Pelczar et al., 7th Edition, Page 568.

17. **Yeast cells are a good source of:**

(a) Vitamin A and B
(b) Vitamin A and D
(c) Vitamin B and D
(d) All of the above

17. **Yeast cells are a good source of:**

(a) Vitamin A and B

(b) Vitamin A and D

(c) Vitamin B and D

(d) All of the above

- **Explanation**:
- **Yeast as a Nutritional Source:**
  - Rich in **B-complex vitamins** such as **riboflavin (B2)**, **niacin (B3)**, and **biotin (B7)**.
  - Also a source of **vitamin D** when exposed to UV light, as yeast can synthesize it.
- Yeast is widely used as a nutritional supplement in various dietary preparations.
- **Incorrect Options:**
  - **Vitamin A:** Not found in significant quantities in yeast.

Reference: Microbiology by Prescott et al., 10th Edition, Page 213.

18. **When the viral genome gets inserted into bacterial host, it is termed as:**

(a) Replication
(b) Lytic cycle
(c) Lysogenic cycle
(d) Capsid formation

18. **When the viral genome gets inserted into bacterial host, it is termed as:**

(a) Replication
(b) Lytic cycle
(c) Lysogenic cycle
(d) Capsid formation

- **Explanation:**
- **Lysogenic Cycle:**
  - This is a viral replication cycle where the viral genome integrates into the host bacterium's DNA without causing immediate destruction of the host cell.
  - The virus in this dormant state is called a **prophage**.
  - During this phase:
    - The viral DNA is copied along with the host DNA during cell division, ensuring its presence in all daughter cells.
    - The virus does not actively produce new viral particles until it is triggered to enter the **lytic cycle**.

Steps in Lysogenic Cycle:

1. **Attachment:** The bacteriophage attaches to the bacterial cell wall.
2. **Integration:** The viral genome integrates into the host's genome using a viral enzyme called **integrase**.
3. **Replication:** The host cell replicates its DNA along with the integrated viral genome.
4. **Trigger to Lytic Cycle:** Certain triggers, such as UV light or stress, may cause the prophage to excise itself and enter the lytic cycle, where active viral replication and cell lysis occur.

Incorrect Options:

- **(a) Replication:** Refers to the copying of viral genetic material but does not explain integration.
- **(b) Lytic cycle:** A separate process where the viral genome hijacks the host machinery to produce viral particles, eventually lysing the host cell.
- **(d) Capsid formation:** Refers to the assembly of viral protein coats during the lytic cycle, not relevant to lysogeny.

Reference:

Molecular Biology of the Cell by Alberts et al., 6th Edition, Page 362.

19. **Transduction involves:**

(a) Bacteria obtaining DNA from the external environment

(b) Bacteria obtaining DNA from the mother cell

(c) Transfer of genetic material by conjugation

(d) Transfer of genetic material through virus

19. **Transduction involves:**

(a) Bacteria obtaining DNA from the external environment

(b) Bacteria obtaining DNA from the mother cell

(c) Transfer of genetic material by conjugation

(d) Transfer of genetic material through virus

- **Explanation:**
- **Transduction:**
  - A process in which **bacteriophages (viruses that infect bacteria)** transfer genetic material from one bacterial cell to another. This is an example of **horizontal gene transfer.**

Types of Transduction:

1. **Generalized Transduction:**
   - Occurs during the **lytic cycle** of bacteriophages.
   - Any bacterial gene can be transferred when a fragment of bacterial DNA is mistakenly packed into the viral capsid instead of viral DNA.

2. Specialized Transduction:

- Occurs during the **lysogenic cycle.**
- Only specific bacterial genes adjacent to the integrated prophage DNA are transferred when the prophage excises incorrectly.

Significance:

- Transduction is a crucial mechanism for the spread of **antibiotic resistance genes** and other traits among bacterial populations.

Incorrect Options:

- **(a):** This describes transformation, not transduction.
- **(b):** Refers to vertical gene transfer, not horizontal.
- **(c):** Refers to conjugation, where genetic material is transferred via a pilus, not a virus.

Reference:

Microbiology by Pelczar et al., 7th Edition, Page 622.

20. **Which of the following is used as a vector in genetic engineering?**

(a) Bacteriophage
(b) Plasmid
(c) Plasmodium
(d) Both (a) and (b)

20. **Which of the following is used as a vector in genetic engineering?**

(a) Bacteriophage
(b) Plasmid
(c) Plasmodium
(d) Both (a) and (b)

- **Explanation:**
- **Vectors in Genetic Engineering:**
  - **Vectors** are DNA molecules that can carry a foreign gene into a host organism for genetic manipulation.

1. **Plasmid (b):**
   - Circular, double-stranded DNA found in bacteria.
   - Widely used in genetic engineering due to its:
     - **Self-replicating ability.**
     - **Ease of insertion of foreign genes.**
     - Common examples include **pBR322** and **pUC18.**

2. Bacteriophage (a):

- Viruses that infect bacteria.
- Phages like **λ phage** are used as vectors in genetic engineering.
- Advantages:
  - High **cloning capacity** compared to plasmids.
  - Efficient delivery of the foreign gene into bacterial hosts.

Plasmodium (c):

- Incorrect because Plasmodium is a parasite causing malaria and has no role as a genetic vector.

Reference:

Genetics: Analysis and Principles by Robert Brooker, 5th Edition, Page 345.

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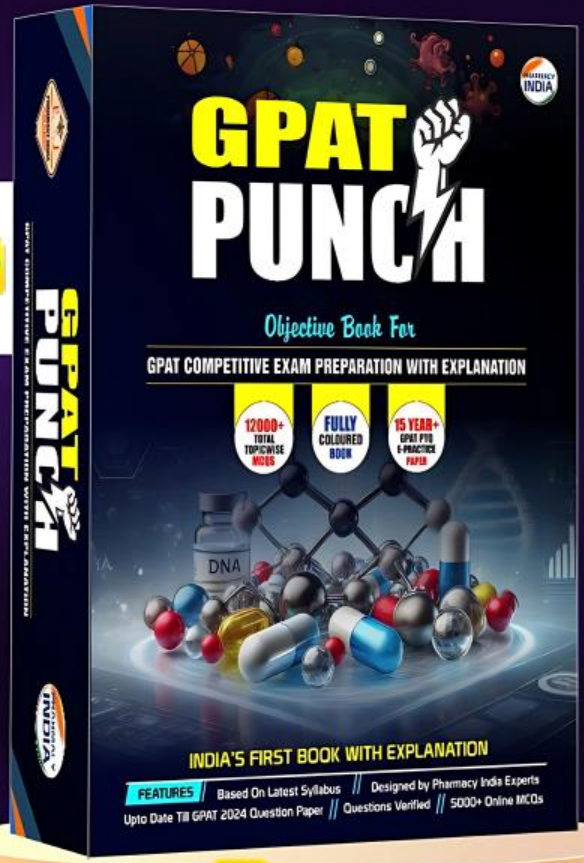

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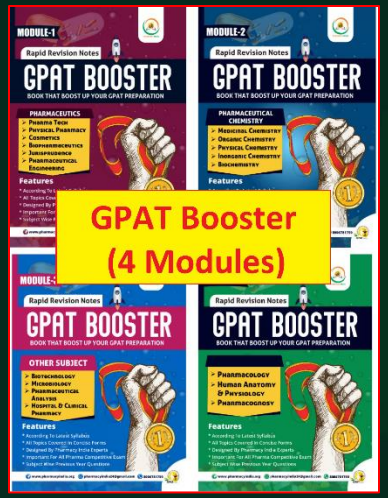

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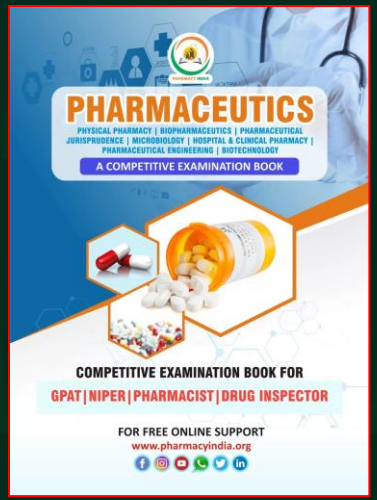

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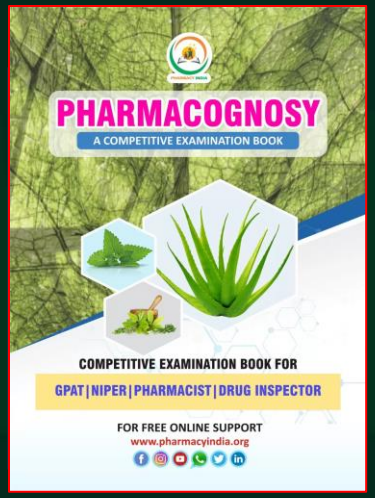

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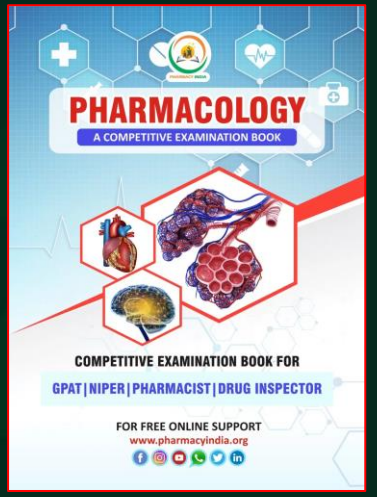

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21. **Which of the following fungi is known for producing aflatoxins?**

(a) Penicillium notatum
(b) Aspergillus flavus
(c) Candida albicans
(d) Saccharomyces cerevisiae

21. **Which of the following fungi is known for producing aflatoxins?**

(a) Penicillium notatum

(b) Aspergillus flavus

(c) Candida albicans

(d) Saccharomyces cerevisiae

- **Explanation**:
- **Aflatoxins** are toxic secondary metabolites produced by certain molds, primarily **Aspergillus flavus** and **Aspergillus parasiticus**.
- These toxins are highly carcinogenic and commonly contaminate foodstuffs like peanuts, maize, and grains, especially in warm and humid climates.
- **Impact:**
  - Aflatoxins can cause **hepatocellular carcinoma (liver cancer)** in humans.
  - They are regulated in food safety standards worldwide due to their severe health risks.

Incorrect Options:

- **(a) Penicillium notatum:** Produces penicillin but not aflatoxins.
- **(c) Candida albicans:** A pathogenic yeast causing candidiasis.
- **(d) Saccharomyces cerevisiae:** Known as brewer's yeast, used in fermentation.

Reference:

Essential Microbiology by John Wiley & Sons, Page 220.

22. **Assertion (A): All fungi are heterotrophic organisms.**
Reason (R): Fungi lack chlorophyll and depend on organic matter for nutrition.

(a) Both (A) and (R) are true, and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
(c) (A) is true, but (R) is false.
(d) (A) is false, but (R) is true.

22. Assertion (A): All fungi are heterotrophic organisms.
Reason (R): Fungi lack chlorophyll and depend on organic matter for nutrition.

(a) Both (A) and (R) are true, and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
(c) (A) is true, but (R) is false.
(d) (A) is false, but (R) is true.

- **Explanation:**
- **Fungi are heterotrophic** because they lack chlorophyll, making them unable to photosynthesize like plants.
- They derive their nutrition from organic matter, often by secreting enzymes and absorbing the digested nutrients.
- Modes of nutrition in fungi include:
  - **Saprophytic:** Feeding on dead organic material (e.g., Rhizopus).
  - **Parasitic:** Feeding on living hosts (e.g., Puccinia).
  - **Symbiotic:** Living in mutualistic relationships (e.g., lichens).

Reference:

Essential Microbiology by John Wiley & Sons, Page 212.

23. **Match the following fungal infections with their causative agents:**

Fungal Infection	Causative Agent
1. Candidiasis	[P] Histoplasma capsulatum
2. Histoplasmosis	[Q] Candida albicans
3. Aspergillosis	[R] Aspergillus fumigatus
4. Dermatophytosis	[S] Trichophyton rubrum

(a) 1-[Q], 2-[P], 3-[R], 4-[S]
(b) 1-[R], 2-[P], 3-[Q], 4-[S]
(c) 1-[Q], 2-[R], 3-[P], 4-[S]
(d) 1-[S], 2-[P], 3-[Q], 4-[R]

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(a) 1-[Q], 2-[P], 3-[R], 4-[S]
(b) 1-[R], 2-[P], 3-[Q], 4-[S]
(c) 1-[Q], 2-[R], 3-[P], 4-[S]
(d) 1-[S], 2-[P], 3-[Q], 4-[R]

- **Explanation:**

Fungal Infection	Causative Agent	Details
Candidiasis	Candida albicans (Q):	Common opportunistic infection in immunocompromised patients.
Histoplasmosis	Histoplasma capsulatum (P):	Found in soil contaminated with bird or bat droppings; causes pulmonary infections.
Aspergillosis	Aspergillus fumigatus (R):	Affects lungs, causing invasive aspergillosis in immunosuppressed individuals.
Dermatophytosis	Trichophyton rubrum (S):	Affects skin, nails, and hair, commonly referred to as ringworm or athlete's foot.

- **Reference:** Essential Microbiology by John Wiley & Sons, Pages 222–225.

24. **The reproductive structure of fungi that produces spores is called the _____.**

(a) Hypha
(b) Mycelium
(c) Sporangium
(d) Conidia

24. **The reproductive structure of fungi that produces spores is called the _____.**

(a) Hypha
(b) Mycelium
(c) Sporangium
(d) Conidia

- **Explanation:**
- **Sporangium:**
  - A specialized structure in fungi where **spores** are formed and stored until they are ready to be released for reproduction.
  - It is found in **zygomycetes** (e.g., Rhizopus) and plays a crucial role in **asexual reproduction**.

Incorrect Options:

- **(a) Hypha:** Structural unit of fungi, forming the mycelium.
- **(b) Mycelium:** A network of hyphae.
- **(d) Conidia:** Asexual spores formed on conidiophores, not in sporangia.

Reference: Essential Microbiology by John Wiley & Sons, Page 230.

25. **The antiviral drug Zidovudine is primarily used in the treatment of which viral infection?**

(a) Influenza
(b) Herpes simplex
(c) HIV/AIDS
(d) Hepatitis B

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(a) Influenza

(b) Herpes simplex

(c) HIV/AIDS

(d) Hepatitis B

- **Explanation:**
- **Zidovudine (AZT):**
  - Zidovudine is a **nucleoside reverse transcriptase inhibitor (NRTI)**, one of the earliest drugs approved for treating **HIV/AIDS.**
  - It works by inhibiting the **reverse transcriptase enzyme**, a critical component in the replication cycle of retroviruses like HIV.
  - By mimicking natural nucleosides, Zidovudine gets incorporated into the growing DNA chain during viral replication, causing chain termination.

- **Use in HIV/AIDS:**
  - Zidovudine is often part of **Highly Active Antiretroviral Therapy (HAART),** where it is combined with other antiretroviral drugs to prevent resistance development and improve efficacy.

Incorrect Options:

- **(a) Influenza:** Treated with neuraminidase inhibitors like Oseltamivir, not Zidovudine.
- **(b) Herpes simplex:** Managed with acyclovir, a DNA polymerase inhibitor.
- **(d) Hepatitis B:** Treated with drugs like Tenofovir or Lamivudine, not Zidovudine.

Reference: Pharmacology by Goodman & Gilman, 13th Edition, Page 1372.

26. **Which of the following fungi is commonly used in the industrial production of citric acid?**

(a) Saccharomyces cerevisiae
(b) Aspergillus niger
(c) Candida albicans
(d) Rhizopus stolonifer

26. **Which of the following fungi is commonly used in the industrial production of citric acid?**

(a) Saccharomyces cerevisiae

(b) Aspergillus niger

(c) Candida albicans

(d) Rhizopus stolonifer

- **Explanation:**
- **Aspergillus niger:**
  - A filamentous fungus extensively used in industrial biotechnology for producing **citric acid**, which is one of the most widely used organic acids in food and pharmaceutical industries.
  - The process involves **submerged fermentation**, where Aspergillus niger is cultured in sugar-containing media, and citric acid is secreted as a metabolic by-product under specific conditions, such as low iron concentration and high sugar levels.

Industrial Significance:

- Citric acid is used as:
  - A preservative and flavor enhancer in food.
  - A stabilizing agent in pharmaceuticals.
  - A chelating agent in cleaning products.

Incorrect Options:

- **(a) Saccharomyces cerevisiae:** Used in alcohol and bread production.
- **(c) Candida albicans:** A pathogenic yeast, not used industrially.
- **(d) Rhizopus stolonifer:** Used in the production of organic acids but not primarily citric acid.

Reference: Industrial Microbiology by A.H. Patel, 2nd Edition, Page 235.

27. **The capsid of a virus is made up of which structural units?**

(a) Lipids
(b) Polysaccharides
(c) Proteins
(d) Nucleic acids

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(a) Lipids
(b) Polysaccharides
(c) Proteins
(d) Nucleic acids

- **Explanation:**
- **Capsid:**
  - The capsid is the **protein shell** that encases the viral genome (DNA or RNA) and provides structural support and protection.
  - It is composed of **repeating protein subunits** called **capsomeres**, which self-assemble into various shapes such as helical, icosahedral, or complex structures.
- **Functions of the Capsid:**
  - Protects the viral genome from enzymatic degradation.
  - Facilitates attachment to host cells via specific receptor binding.
  - Plays a role in viral entry and genome delivery into host cells.

Incorrect Options:

- **(a) Lipids:** Lipids are present in the viral envelope, not the capsid.
- **(b) Polysaccharides:** Found in bacterial capsules but not in viruses.
- **(d) Nucleic acids:** Constitute the genetic material of the virus, not the capsid.

Reference:

Molecular Biology of the Cell by Alberts et al., 6th Edition, Page 414.

28. **Which of the following fungi is used in the production of immunosuppressive drugs like Cyclosporine?**

(a) Penicillium notatum
(b) Saccharomyces cerevisiae
(c) Aspergillus flavus
(d) Tolypocladium inflatum

28. **Which of the following fungi is used in the production of immunosuppressive drugs like Cyclosporine?**

(a) Penicillium notatum
(b) Saccharomyces cerevisiae
(c) Aspergillus flavus
(d) Tolypocladium inflatum

- **Explanation**:
- **Cyclosporine:**
  - It is a powerful **immunosuppressive drug** used to prevent organ transplant rejection and treat autoimmune diseases like rheumatoid arthritis.
  - The drug is produced by **Tolypocladium inflatum**, a filamentous fungus known for synthesizing this secondary metabolite during fermentation.
  - Cyclosporine inhibits **calcineurin**, a protein phosphatase critical for T-cell activation, thereby suppressing the immune response.

Incorrect Options:

- **(a) Penicillium notatum:** Produces penicillin, not immunosuppressants.
- **(b) Saccharomyces cerevisiae:** Used in brewing and baking, not drug production.
- **(c) Aspergillus flavus:** Produces aflatoxins, not cyclosporine.

Reference:

Industrial Microbiology by A.H. Patel, 2nd Edition, Page 287.

29. **Which type of nucleic acid is found in the Rabies virus?**

(a) Double-stranded DNA
(b) Single-stranded RNA
(c) Single-stranded DNA
(d) Double-stranded RNA

29. **Which type of nucleic acid is found in the Rabies virus?**

(a) Double-stranded DNA

(b) Single-stranded RNA

(c) Single-stranded DNA

(d) Double-stranded RNA

- **Explanation:**
- **Rabies Virus:**
  - Belongs to the family **Rhabdoviridae** and is a bullet-shaped, **enveloped virus.**
  - Its genome is composed of **single-stranded RNA** (negative sense), which means the RNA must be transcribed into a complementary positive strand before translation.

Pathogenicity:

- The virus primarily affects the **central nervous system (CNS)**, causing rabies, a fatal neurological disease transmitted via animal bites.

Incorrect Options:

- **(a) Double-stranded DNA:** Found in viruses like herpesviruses.
- **(c) Single-stranded DNA:** Found in parvoviruses.
- **(d) Double-stranded RNA:** Found in reoviruses.

Reference: Medical Microbiology by Jawetz et al., 28th Edition, Page 549.

30. **Match the following fungal enzymes with their industrial applications:**

Fungal Enzyme	Industrial Application
1. Cellulase	[P] Baking industry
2. Amylase	[Q] Paper and pulp industry
3. Lipase	[R] Detergent formulation
4. Pectinase	[S] Fruit juice clarification

(a) 1-[Q], 2-[P], 3-[R], 4-[S]
(b) 1-[R], 2-[Q], 3-[P], 4-[S]
(c) 1-[Q], 2-[R], 3-[S], 4-[P]
(d) 1-[S], 2-[P], 3-[R], 4-[Q]

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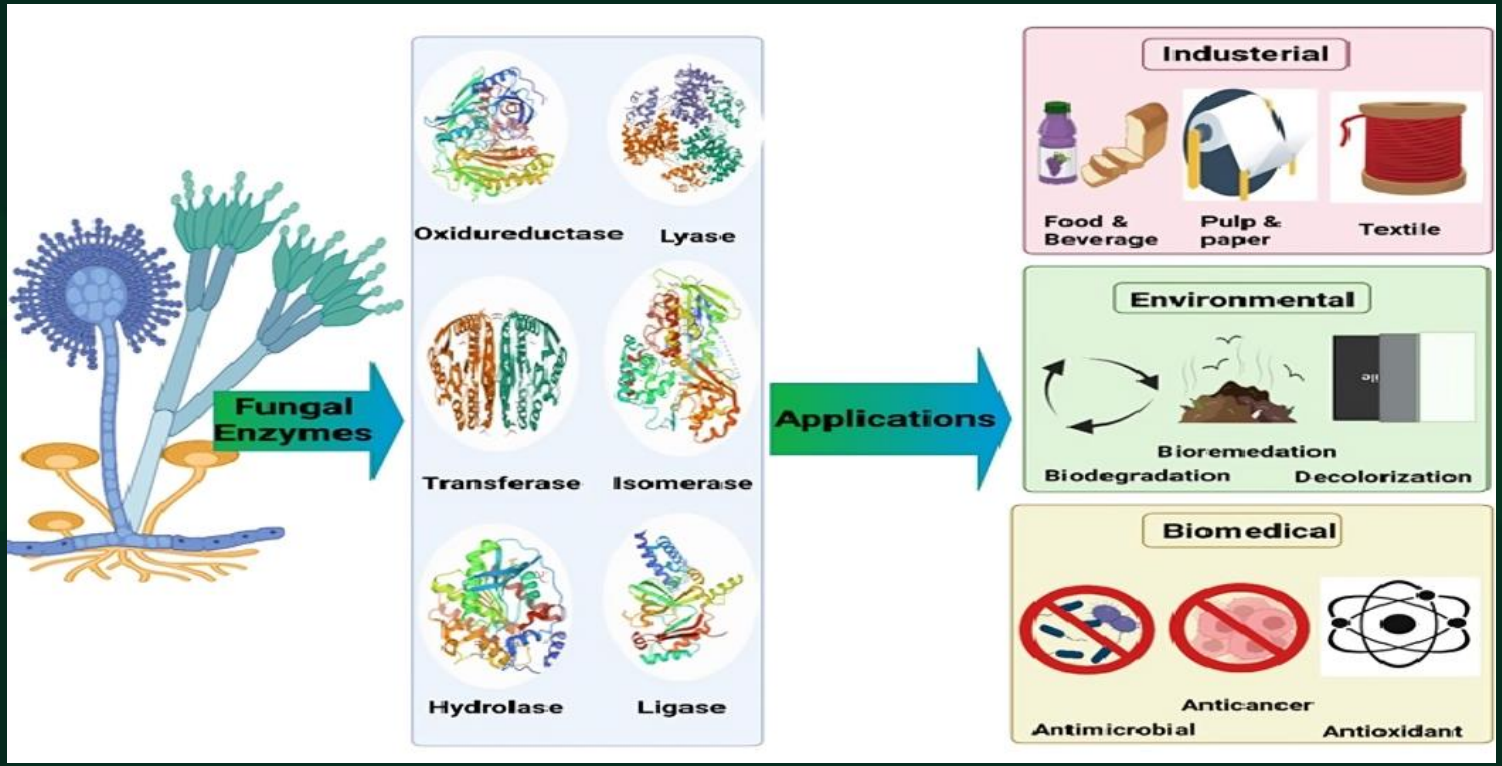
(b) 1-[R], 2-[Q], 3-[P], 4-[S]

(c) 1-[Q], 2-[R], 3-[S], 4-[P]

(d) 1-[S], 2-[P], 3-[R], 4-[Q]

. Explanation:

Fungal Enzyme	Industrial Application	Details
Cellulase	[Q]: Paper and pulp industry	Used to degrade cellulose into glucose, aiding in bio-bleaching and recycling.
Amylase	[P]: Baking industry	Breaks down starch into sugars, improving dough quality and fermentation.
Lipase	[R]: Detergent formulation	Breaks down fats and oils, enhancing detergent cleaning properties.
Pectinase	[S]: Fruit juice clarification	Breaks down pectin, improving the yield and clarity of fruit juices.



Reference:

Industrial Microbiology by Casida, 3rd Edition, Page 312.

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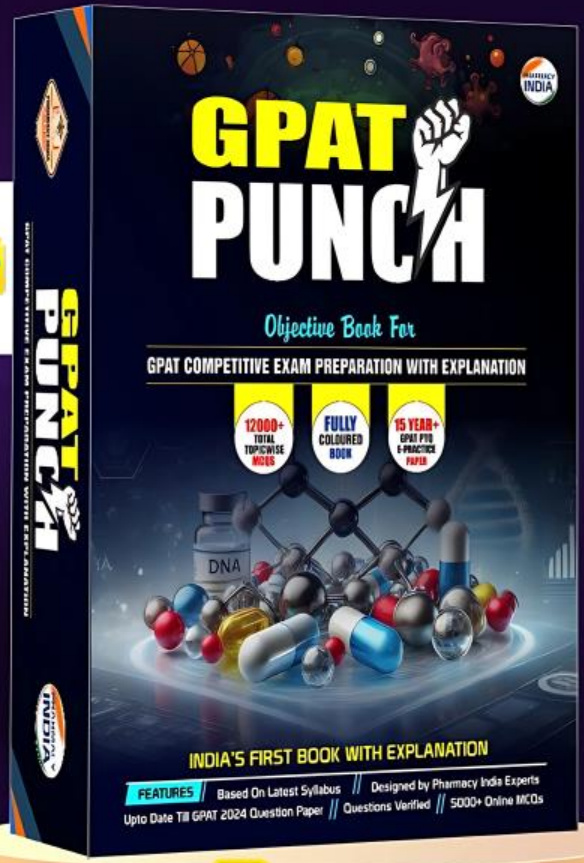

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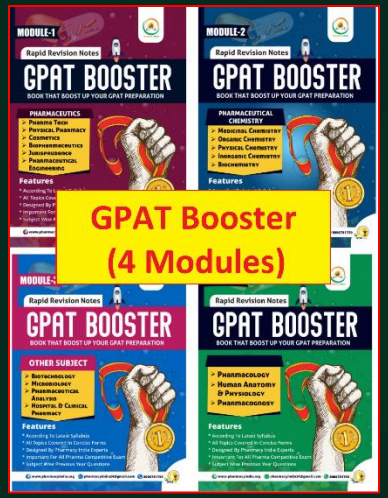

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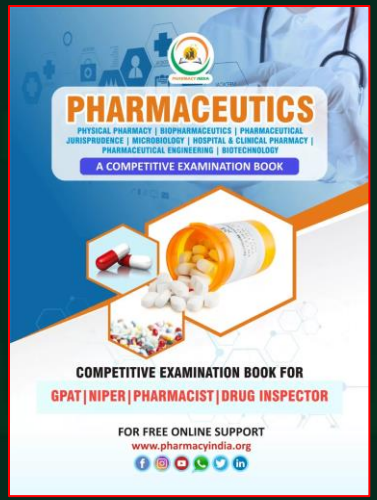

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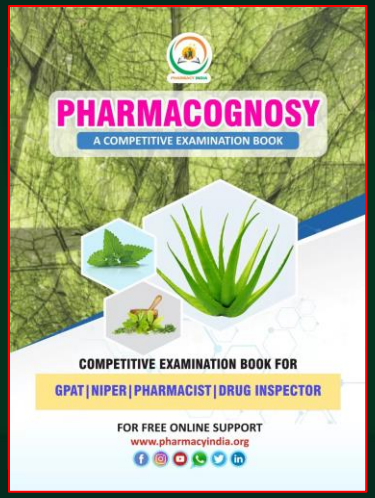

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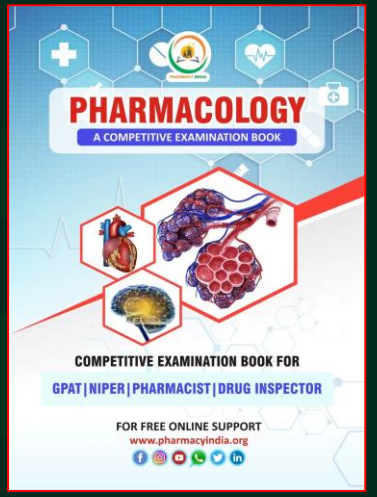

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31. **Which of the following fungi is responsible for causing ergotism in humans?**

(a) Aspergillus flavus
(b) Claviceps purpurea
(c) Candida albicans
(d) Rhizopus stolonifer

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(a) Aspergillus flavus

(b) Claviceps purpurea

(c) Candida albicans

(d) Rhizopus stolonifer

- **Explanation:**
- **Ergotism:**
  - A condition caused by consuming grains contaminated with **ergot alkaloids** produced by **Claviceps purpurea**, a fungal pathogen affecting cereal crops like rye.
  - Ergot alkaloids include **ergotamine** and **lysergic acid**, which act on smooth muscles and the central nervous system.

Types of Ergotism:

1. **Convulsive Ergotism:** Causes seizures, muscle spasms, and hallucinations.
2. **Gangrenous Ergotism:** Results from vasoconstriction, leading to tissue death and gangrene.

Incorrect Options:

- **(a) Aspergillus flavus:** Produces aflatoxins, not ergot alkaloids.
- **(c) Candida albicans:** Causes candidiasis, not ergotism.
- **(d) Rhizopus stolonifer:** Known for causing food spoilage (bread mold), not ergotism.

Reference:

Medical Mycology by Rippon, 3rd Edition, Page 134.

32. **Which of the following viruses is enveloped and has a double-stranded DNA genome?**

(a) Adenovirus
(b) Hepatitis B virus
(c) Herpes simplex virus
(d) Reovirus

32. **Which of the following viruses is enveloped and has a double-stranded DNA genome?**

(a) Adenovirus
(b) Hepatitis B virus
(c) Herpes simplex virus
(d) Reovirus

- **Explanation**:
- **Herpes Simplex Virus (HSV):**
  - Belongs to the **Herpesviridae family** and has an **enveloped capsid** containing a double-stranded DNA genome.
  - HSV is responsible for causing infections like oral herpes (HSV-1) and genital herpes (HSV-2).

Key Features of HSV:

- Latency: HSV establishes lifelong latency in sensory ganglia, with periodic reactivation under stress or immunosuppression.
- Envelope: The envelope is derived from the host cell membrane during budding and contains viral glycoproteins essential for host cell entry.

Incorrect Options:

- **(a) Adenovirus:** Non-enveloped, double-stranded DNA virus.
- **(b) Hepatitis B virus:** Enveloped, but it contains partially double-stranded DNA.
- **(d) Reovirus:** Non-enveloped, double-stranded RNA virus.

Reference:

Medical Microbiology by Jawetz et al., 28th Edition, Page 550.

33. The process by which bacteriophages transfer DNA from one bacterium to another is called _____.

(a) Conjugation
(b) Transformation
(c) Transduction
(d) Replication

33. **The process by which bacteriophages transfer DNA from one bacterium to another is called _____.**

(a) Conjugation

(b) Transformation

(c) Transduction

(d) Replication

- **Explanation**:
- **Transduction**:
  - A form of horizontal gene transfer in bacteria mediated by **bacteriophages** (viruses that infect bacteria).
  - During the lytic or lysogenic cycle, a phage can accidentally package bacterial DNA into its capsid, transferring it to a new bacterial host.

Types of Transduction:

1. **Generalized Transduction**: Any bacterial gene can be transferred, typically during the lytic cycle.
2. **Specialized Transduction**: Only specific genes near the prophage integration site are transferred during the lysogenic cycle.

Incorrect Options:

- **(a) Conjugation:** Transfer of DNA via a pilus in bacteria.
- **(b) Transformation:** Uptake of naked DNA from the environment by bacteria.
- **(d) Replication:** Copying of genetic material, not related to DNA transfer.

Reference:

Microbiology by Prescott et al., 10th Edition, Page 312.

34. **Match the following viral diseases with their causative agents:**

Disease	Causative Agent
1. Dengue Fever	[P] Rotavirus
2. Poliomyelitis	[Q] Flavivirus
3. Viral Diarrhea	[R] Poliovirus
4. Chickenpox	[S] Varicella-Zoster Virus

(a) 1-[Q], 2-[R], 3-[P], 4-[S]
(b) 1-[P], 2-[S], 3-[R], 4-[Q]
(c) 1-[S], 2-[Q], 3-[P], 4-[R]
(d) 1-[R], 2-[P], 3-[S], 4-[Q]

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(a) 1-[Q], 2-[R], 3-[P], 4-[S]

(b) 1-[P], 2-[S], 3-[R], 4-[Q]

(c) 1-[S], 2-[Q], 3-[P], 4-[R]

(d) 1-[R], 2-[P], 3-[S], 4-[Q]

- **Explanation:**

Disease	Causative Agent	Details
Dengue Fever	Flavivirus (Q):	Transmitted by Aedes mosquitoes; causes fever, rash, and hemorrhagic symptoms.
Poliomyelitis	Poliovirus (R):	Affects motor neurons, causing paralysis; eradicated in many regions due to vaccines.
Viral Diarrhea	Rotavirus (P):	Common in children; causes severe dehydration.
Chicken pox	Varicella-Zoster Virus (S):	Causes a vesicular rash during primary infection; reactivates as shingles later in life.

Reference: Medical Microbiology by Jawetz et al., 28th Edition, Pages 512–515.

35. The process by which bacteriophages transfer DNA from one bacterium to another is called _____.

(a) Conjugation
(b) Transformation
(c) Transduction
(d) Replication

35. The process by which bacteriophages transfer DNA from one bacterium to another is called _____.

(a) Conjugation
(b) Transformation
(c) Transduction
(d) Replication

- **Explanation:**
- **Transduction:**
  - This is a mechanism of horizontal gene transfer in bacteria mediated by **bacteriophages** (viruses that infect bacteria).
  - It occurs when a phage accidentally packages a fragment of bacterial DNA into its capsid during replication and transfers it to a new host bacterial cell.

Types of Transduction:

1. **Generalized Transduction:** Occurs during the lytic cycle, where any bacterial gene can be transferred.
2. **Specialized Transduction:** Occurs during the lysogenic cycle, where only specific genes near the prophage insertion site are transferred.

Incorrect Options:

- **(a) Conjugation:** Involves direct transfer of genetic material through a pilus in bacteria.
- **(b) Transformation:** Involves uptake of naked DNA from the environment.
- **(d) Replication:** Refers to the process of copying genetic material, not transfer.

Reference:

Microbiology by Prescott et al., 10th Edition, Page 312.

36. Viruses that infect bacteria are called _____.

(a) Bacteriophages
(b) Viroids
(c) Prions
(d) Mycoplasmas

36. Viruses that infect bacteria are called _____.

(a) Bacteriophages

(b) Viroids

(c) Prions

(d) Mycoplasmas

- **Explanation:**
- **Bacteriophages:**
  - These are viruses that specifically infect **bacteria.**
  - They consist of a protein coat (capsid) and nucleic acid (DNA or RNA).
  - They play a significant role in genetics, biotechnology, and horizontal gene transfer.

Types of Bacteriophages:

1. **Lytic Phages:** Destroy the host cell during replication.
2. **Lysogenic Phages:** Integrate their genome into the host DNA and can later switch to the lytic cycle.

Incorrect Options:

- **(b) Viroids:** Infectious RNA molecules without a protein coat, affecting plants.
- **(c) Prions:** Infectious proteins that cause diseases like Creutzfeldt-Jakob disease in humans.
- **(d) Mycoplasmas:** Smallest self-replicating prokaryotes, not viruses.

Reference:

Molecular Biology of the Gene by Watson et al., 7th Edition, Page 512.

37. **Match the following antiviral drugs with their target viral enzymes:**

Antiviral Drug	Target Enzyme
1. Acyclovir	[P] Reverse transcriptase
2. Zidovudine (AZT)	[Q] RNA polymerase
3. Oseltamivir	[R] DNA polymerase
4. Ritonavir	[S] Neuraminidase

(a) 1-[R], 2-[P], 3-[S], 4-[Q]

(b) 1-[P], 2-[R], 3-[S], 4-[Q]

(c) 1-[R], 2-[P], 3-[S], 4-[S]

(d) 1-[R], 2-[P], 3-[S], 4-[S]

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(a) 1-[R], 2-[P], 3-[S], 4-[Q]

(b) 1-[P], 2-[R], 3-[S], 4-[Q]

(c) 1-[R], 2-[P], 3-[S], 4-[S]

(d) 1-[R], 2-[P], 3-[S], 4-[S]

- **Explanation:**

Antiviral Drug	Target Enzyme	Details
Acyclovir	DNA polymerase (R):	Used to treat herpesvirus infections by inhibiting viral DNA synthesis.
Zidovudine (AZT)	Reverse transcriptase (P):	A nucleoside analog that inhibits reverse transcriptase, used in HIV treatment.
Oseltamivir	Neuraminidase (S):	Blocks viral release in influenza by inhibiting neuraminidase activity.
Ritonavir	RNA polymerase (Q):	A protease inhibitor used in combination with other antiretrovirals for HIV treatment.

Reference:

Goodman & Gilman's Pharmacological Basis of Therapeutics, 13th Edition, Page 1390.

38. **Dengue fever is transmitted by which species of mosquito?**

(a) Aedes aegypti
(b) Anopheles gambiae
(c) Culex pipiens
(d) Mansonia annulifera

38. **Dengue fever is transmitted by which species of mosquito?**

(a) Aedes aegypti
(b) Anopheles gambiae
(c) Culex pipiens
(d) Mansonia annulifera

- **Explanation:**
- **Dengue Fever Transmission:**
  - Caused by the **Dengue virus**, which belongs to the **Flavivirus** genus.
  - Transmitted primarily by **Aedes aegypti**, a day-biting mosquito that breeds in stagnant water.

Lifecycle and Behavior:

- The mosquito acquires the virus by biting an infected person and transmits it to another individual during subsequent feedings.
- It thrives in tropical and subtropical climates, leading to outbreaks during the rainy season.

Incorrect Options:

- **(b) Anopheles gambiae:** Vector for malaria, not dengue.
- **(c) Culex pipiens:** Transmits diseases like Japanese encephalitis.
- **(d) Mansonia annulifera:** Transmits filariasis.

Reference:

Medical Microbiology by Murray et al., 8th Edition, Page 482.

39. **Which of the following is NOT a characteristic of fungi?**

(a) Cell walls are composed of chitin.
(b) Fungi are autotrophic organisms.
(c) They reproduce through spores.
(d) They grow as single cells or filaments.

39. **Which of the following is NOT a characteristic of fungi?**

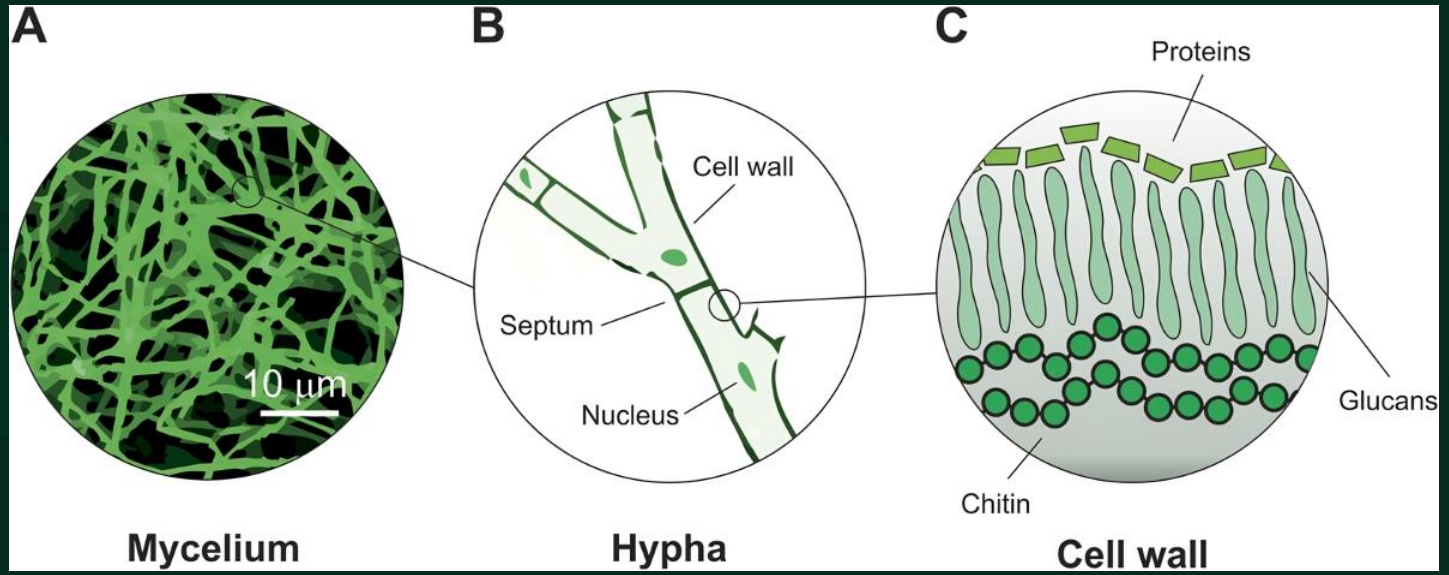
(a) Cell walls are composed of chitin.

(b) Fungi are autotrophic organisms.

(c) They reproduce through spores.

(d) They grow as single cells or filaments.

- **Explanation:**
- **Fungi Characteristics:**
  - **Heterotrophic Nutrition:** Fungi lack chlorophyll and cannot perform photosynthesis. They depend on organic matter for nutrition, making them **heterotrophs**, not autotrophs.
  - **Cell Wall Composition:** Fungal cell walls are primarily made of **chitin**, unlike plant cell walls, which contain cellulose.
  - **Reproduction:** Fungi reproduce both sexually and asexually through **spores** (e.g., conidia, sporangia).
  - **Growth Forms:** They exist as **unicellular yeasts** or multicellular, thread-like filaments known as **hyphae** that form a network called **mycelium**.



Reference:

Essential Microbiology by John Wiley & Sons, Page 214.

40. **Which of the following viruses has a segmented genome?**

(a) Poliovirus
(b) Influenza virus
(c) Herpes simplex virus
(d) Rabies virus

40. **Which of the following viruses has a segmented genome?**

(a) Poliovirus

(b) Influenza virus

(c) Herpes simplex virus

(d) Rabies virus

- **Explanation:**
- **Segmented Genome in Influenza Virus:**
  - The influenza virus belongs to the **Orthomyxoviridae family** and has a **negative-sense, segmented RNA genome** consisting of **8 segments.**
  - This segmentation allows genetic reassortment, a process where segments from different strains mix during co-infection, leading to new viral strains (e.g., pandemics like H1N1).

Incorrect Options:

- **(a) Poliovirus:** A single-stranded RNA virus with a non-segmented genome.
- **(c) Herpes simplex virus:** A double-stranded DNA virus with a continuous genome.
- **(d) Rabies virus:** A single-stranded RNA virus with a non-segmented genome.

Reference:

Medical Microbiology by Jawetz et al., 28th Edition, Page 555.

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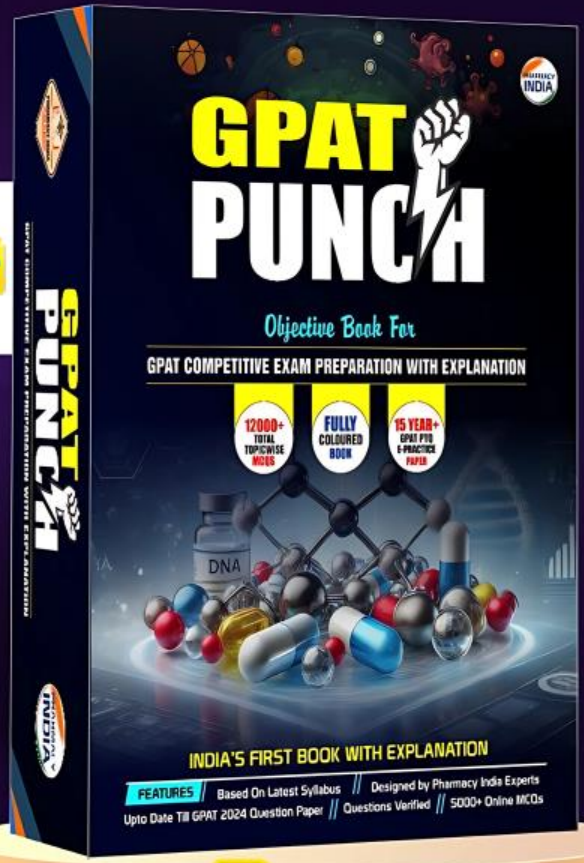

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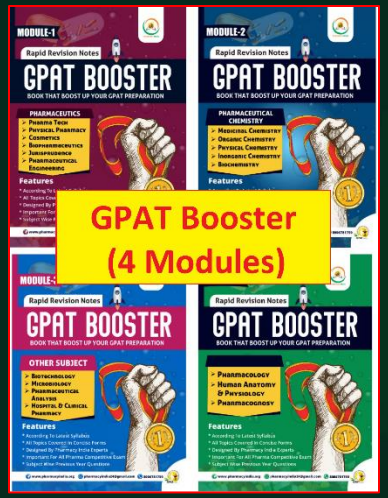

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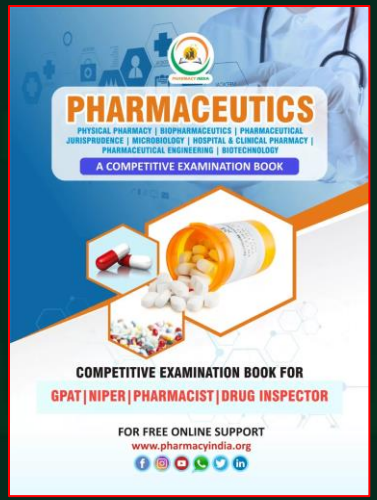

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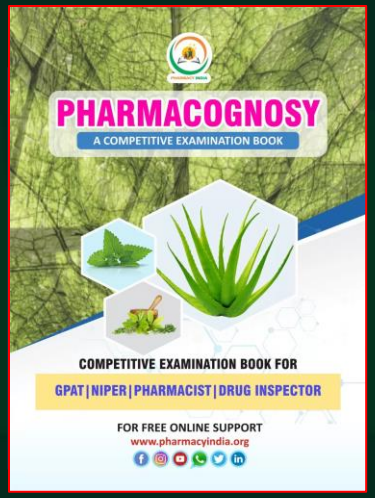

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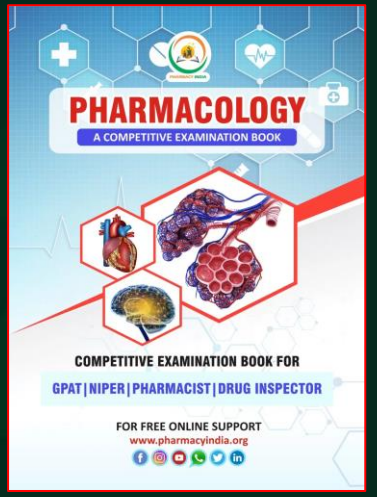

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41. **Match the following fungal structures with their functions:**

Fungal Structure	Function
1. Mycelium	[P] Sexual reproduction
2. Conidia	[Q] Asexual reproduction
3. Sporangium	[R] Storage of reproductive spores
4. Zygospore	[S] Absorption of nutrients

(a) 1-[S], 2-[Q], 3-[R], 4-[P]
(b) 1-[Q], 2-[R], 3-[S], 4-[P]
(c) 1-[P], 2-[S], 3-[R], 4-[Q]
(d) 1-[R], 2-[P], 3-[Q], 4-[S]

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(a) 1-[S], 2-[Q], 3-[R], 4-[P]

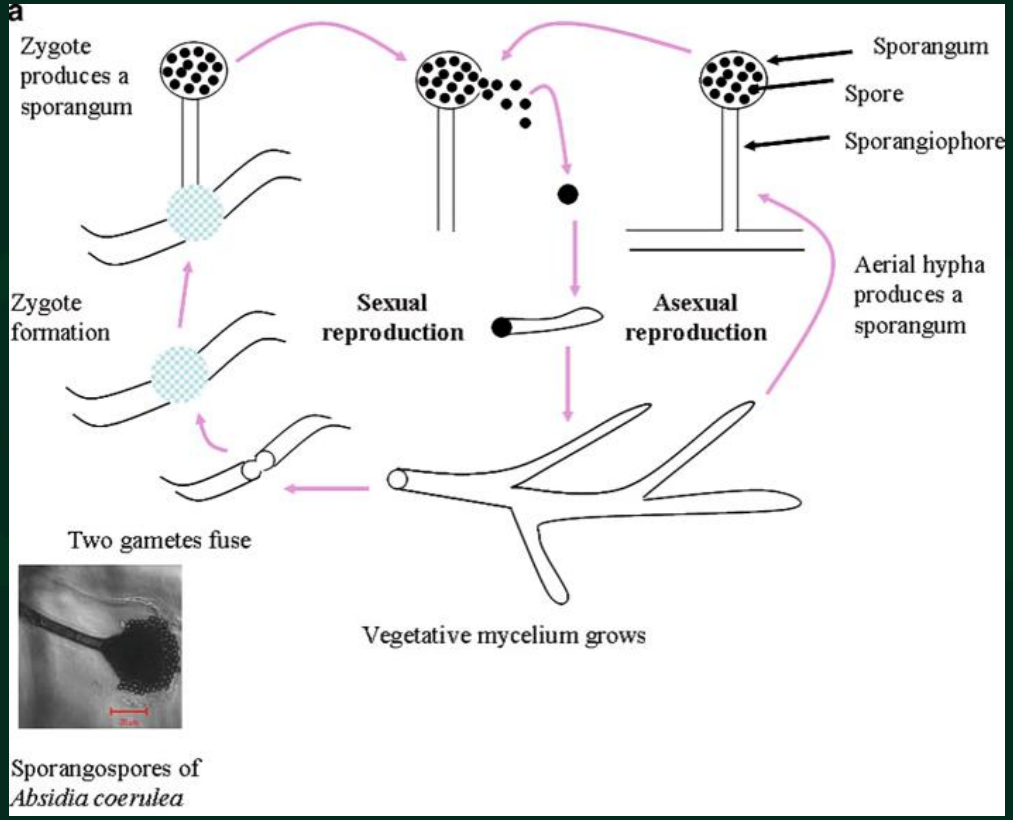
(b) 1-[Q], 2-[R], 3-[S], 4-[P]

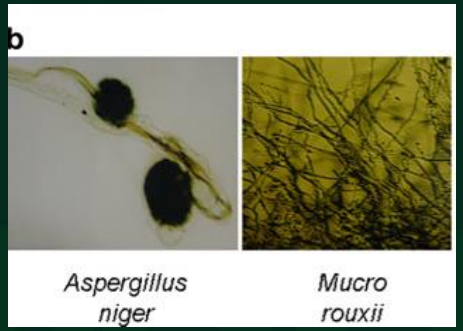
(c) 1-[P], 2-[S], 3-[R], 4-[Q]

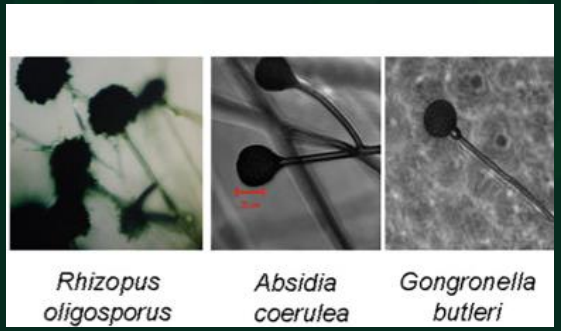
(d) 1-[R], 2-[P], 3-[Q], 4-[S]

- **Explanation:**

Fungal Structure	Function	Details
Mycelium	[S] Absorption of nutrients	A network of hyphae responsible for nutrient absorption and growth.
Conidia	[Q] Asexual reproduction	Non-motile, asexual spores formed on conidiophores.
Sporangium	[R] Storage of reproductive spores	A sac-like structure that produces and stores spores.
Zygospore	[P] Sexual reproduction	A thick-walled spore formed during sexual reproduction in fungi like Rhizopus.







Reference:

Essential Microbiology by John Wiley & Sons, Pages 222–225.

42. **The enzyme reverse transcriptase is essential for which virus?**

(a) Hepatitis C virus
(b) Human Immunodeficiency Virus (HIV)
(c) Influenza virus
(d) Rabies virus

42. **The enzyme reverse transcriptase is essential for which virus?**

(a) Hepatitis C virus

(b) Human Immunodeficiency Virus (HIV)

(c) Influenza virus

(d) Rabies virus

- **Explanation:**
- **Reverse Transcriptase in HIV:**
  - HIV belongs to the **Retroviridae family** and uses the enzyme **reverse transcriptase** to convert its **single-stranded RNA genome** into **double-stranded DNA.**
  - This DNA integrates into the host genome, allowing the virus to hijack the host cell's machinery for replication.

Steps of Reverse Transcription:

1. Synthesis of complementary DNA (cDNA) from RNA.
2. Degradation of the RNA template.
3. Synthesis of a second DNA strand to form double-stranded DNA.

Incorrect Options:

- **(a) Hepatitis C virus:** Replicates directly from RNA without using reverse transcriptase.
- **(c) Influenza virus:** Uses RNA-dependent RNA polymerase for replication.
- **(d) Rabies virus:** Does not require reverse transcription.

Reference:

Virology by Flint et al., 4th Edition, Page 612.

43. The process by which a fungal hypha extends and grows is called _____.

(a) Binary fission
(b) Fragmentation
(c) Apical elongation
(d) Spore germination

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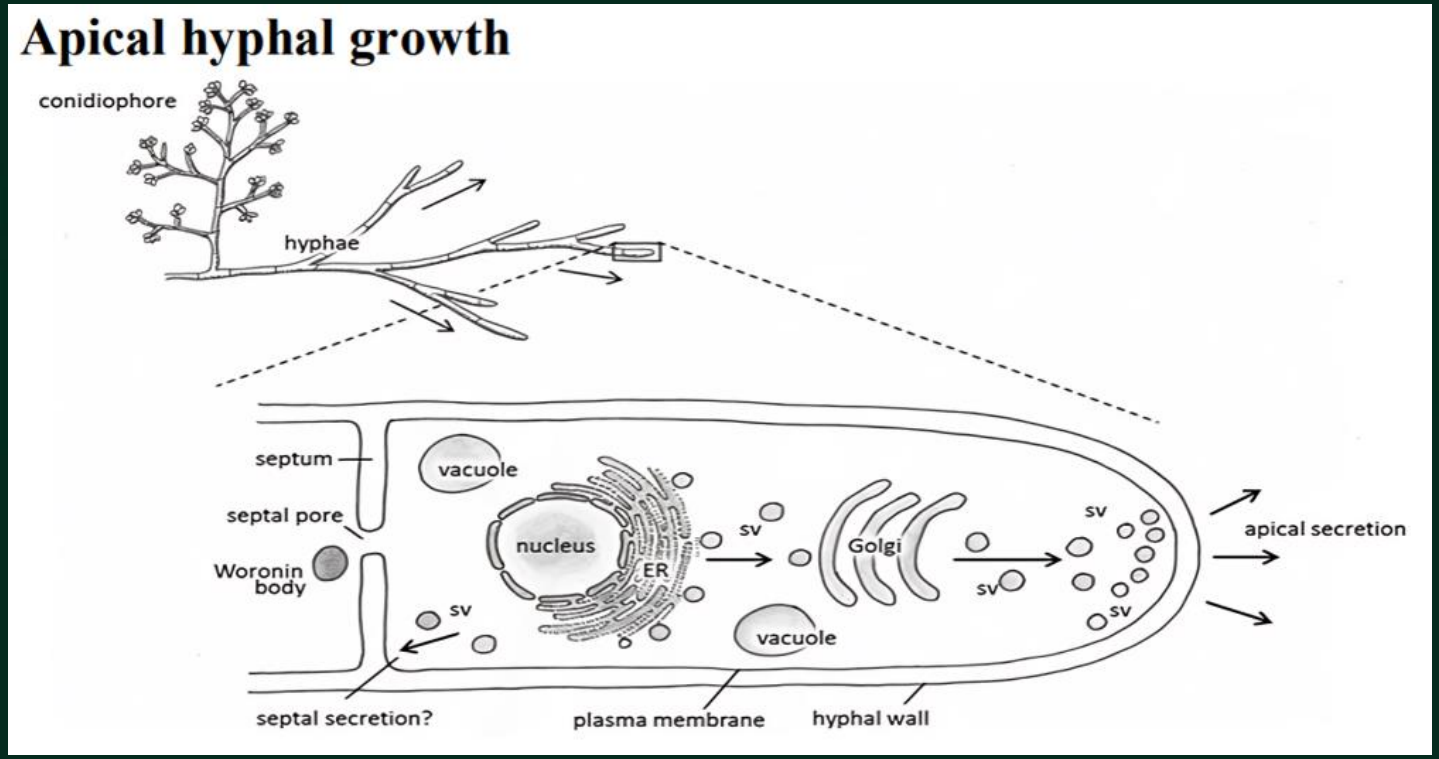
(a) Binary fission
(b) Fragmentation
(c) Apical elongation
(d) Spore germination

- **Explanation:**



- **Apical Elongation:**
  - Fungal hyphae grow through **apical elongation**, where new cell wall material is continuously added at the **tips of hyphae.**
  - This process allows fungi to invade substrates, obtain nutrients, and expand their mycelium.
  - It involves **polarized growth**, with enzymes and vesicles concentrating at the hyphal tip to support extension.

44. **Which viral family includes pathogens that cause measles and mumps?**

(a) Flaviviridae
(b) Paramyxoviridae
(c) Herpesviridae
(d) Retroviridae

44. **Which viral family includes pathogens that cause measles and mumps?**

(a) Flaviviridae

(b) Paramyxoviridae

(c) Herpesviridae

(d) Retroviridae

- **Explanation:**
- **Paramyxoviridae:**
  - This family includes **Measles virus (Morbillivirus)** and **Mumps virus (Rubulavirus)**, both of which are enveloped, single-stranded RNA viruses.
  - These viruses are transmitted via respiratory droplets and are highly contagious.
  - **Measles Virus:** Causes **rubeola**, characterized by fever, rash, and Koplik spots.
  - **Mumps Virus:** Causes swelling of the salivary glands, sometimes leading to complications like orchitis.

Incorrect Options:

- **(a) Flaviviridae:** Includes Dengue virus and Zika virus.
- **(c) Herpesviridae:** Includes Herpes simplex virus and Varicella-zoster virus.
- **(d) Retroviridae:** Includes Human Immunodeficiency Virus (HIV).

Reference:

Medical Microbiology by Jawetz et al., 28th Edition, Page 553.

45. **Match the following fungal reproductive structures with their respective fungi:**

Reproductive Structure	Fungus
1. Zygospore	[P] Rhizopus
2. Basidiospore	[Q] Agaricus
3. Ascospore	[R] Saccharomyces
4. Sporangiospore	[S] Mucor

(a) 1-[P], 2-[Q], 3-[R], 4-[S]
(b) 1-[Q], 2-[P], 3-[R], 4-[S]
(c) 1-[P], 2-[R], 3-[Q], 4-[S]
(d) 1-[S], 2-[Q], 3-[R], 4-[P]

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4. Sporangiospore	[S] Mucor

(a) 1-[P], 2-[Q], 3-[R], 4-[S]

(b) 1-[Q], 2-[P], 3-[R], 4-[S]

(c) 1-[P], 2-[R], 3-[Q], 4-[S]

(d) 1-[S], 2-[Q], 3-[R], 4-[P]

- **Explanation:**

Reproductive Structure	Fungus	Details
Zygospore	Rhizopus (P):	Thick-walled sexual spores formed during unfavorable conditions.
Basidiospore	Agaricus (Q):	Sexual spores produced on basidia in Basidiomycetes (e.g., mushrooms).
Ascospore	Saccharomyces (R):	Sexual spores formed inside asci in Ascomycetes (e.g., yeasts and molds).
Sporangiospore	Mucor (S):	Asexual spores formed within sporangia in Zygomycetes.

Reference: Essential Microbiology by John Wiley & Sons, Pages 222–226.

46. **Which type of nucleic acid is found in retroviruses?**

(a) Double-stranded DNA

(b) Single-stranded RNA

(c) Double-stranded RNA

(d) Single-stranded DNA

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(a) Double-stranded DNA

(b) Single-stranded RNA

(c) Double-stranded RNA

(d) Single-stranded DNA

- **Explanation:**
- **Retroviruses:**
  - Retroviruses, such as **HIV**, have a **single-stranded RNA genome**.
  - The RNA is converted into complementary DNA (cDNA) by the enzyme **reverse transcriptase**, enabling integration into the host genome.

Features of Retroviruses:

1. **Enveloped:** They are surrounded by a lipid envelope containing viral glycoproteins.
2. **Replication Cycle:** Includes reverse transcription, integration into the host genome, and budding of new virions.
3. **Clinical Relevance:** Includes human pathogens like HIV and HTLV.

Incorrect Options:

- **(a) Double-stranded DNA:** Found in herpesviruses, not retroviruses.
- **(c) Double-stranded RNA:** Found in reoviruses.
- **(d) Single-stranded DNA:** Found in parvoviruses.

Reference:

Molecular Biology of the Gene by Watson et al., 7th Edition, Page 620.

47. The ability of certain fungi to exist as both yeast and mold forms is called _____.

(a) Dimorphism
(b) Mycelium formation
(c) Sporulation
(d) Saprophytism

47. **The ability of certain fungi to exist as both yeast and mold forms is called _____.**

(a) Dimorphism

(b) Mycelium formation

(c) Sporulation

(d) Saprophytism

- **Dimorphism in Fungi:**
  - Some fungi can switch between **yeast form** (unicellular) and **mold form** (filamentous) depending on environmental conditions like temperature and nutrient availability.
  - **Example:**
    - **Histoplasma capsulatum** grows as a mold at 25°C and as a yeast at 37°C in a host.
  - This ability is a key virulence factor, as the yeast form often aids in survival within host tissues.

48. **Which of the following is a prion disease?**

(a) Creutzfeldt-Jakob disease
(b) Dengue fever
(c) Poliomyelitis
(d) Influenza

48. **Which of the following is a prion disease?**

(a) Creutzfeldt-Jakob disease

(b) Dengue fever

(c) Poliomyelitis

(d) Influenza

- **Explanation:**
- **Prion Diseases:**
  - Prions are **infectious proteins** that lack nucleic acids.
  - They cause **neurodegenerative disorders** by inducing abnormal folding of normal cellular proteins in the brain, leading to sponge-like damage (spongiform encephalopathy).

Examples of Prion Diseases:

1. **Creutzfeldt-Jakob disease (CJD):** Affects humans, causing dementia and motor symptoms.
2. **Bovine spongiform encephalopathy (BSE):** Known as "mad cow disease."
3. **Kuru:** Found in certain tribes practicing cannibalism.

Incorrect Options:

- **(b) Dengue fever:** Caused by a flavivirus.
- **(c) Poliomyelitis:** Caused by poliovirus.
- **(d) Influenza:** Caused by influenza virus.

Reference:

Medical Microbiology by Jawetz et al., 28th Edition, Page 553.

49. **Match the following viruses with their genetic material:**

Virus	Genetic Material
1. Hepatitis B	[P] Single-stranded DNA
2. Poliovirus	[Q] Single-stranded RNA
3. Influenza Virus	[R] Double-stranded DNA
4. Rotavirus	[S] Double-stranded RNA

(a) 1-[P], 2-[Q], 3-[R], 4-[S]
(b) 1-[R], 2-[Q], 3-[P], 4-[S]
(c) 1-[R], 2-[P], 3-[Q], 4-[S]
(d) 1-[R], 2-[Q], 3-[S], 4-[P]

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1. Hepatitis B	[P] Single-stranded DNA
2. Poliovirus	[Q] Single-stranded RNA
3. Influenza Virus	[R] Double-stranded DNA
4. Rotavirus	[S] Double-stranded RNA

(a) 1-[P], 2-[Q], 3-[R], 4-[S]

(b) 1-[R], 2-[Q], 3-[P], 4-[S]

(c) 1-[R], 2-[P], 3-[Q], 4-[S]

(d) 1-[R], 2-[Q], 3-[S], 4-[P]

- **Explanation:**

Virus	Genetic Material	Details
Hepatitis B	Single-stranded DNA (P):	Partially double-stranded DNA virus, unusual among hepatitis viruses.
Poliovirus	Single-stranded RNA (Q):	Belongs to Picornaviridae; causes poliomyelitis.
Influenza Virus	Double-stranded DNA (R):	A segmented, negative-sense RNA genome allowing reassortment during co-infections.
Rotavirus	Double-stranded RNA (S):	Causes severe diarrhea in children; genome is segmented.

Reference:

Molecular Biology of the Cell by Alberts et al., 6th Edition, Page 512.

50. **Which of the following fungal infections is commonly associated with AIDS patients?**

(a) Aspergillosis
(b) Histoplasmosis
(c) Cryptococcosis
(d) All of the above

50. **Which of the following fungal infections is commonly associated with AIDS patients?**

(a) Aspergillosis
(b) Histoplasmosis
(c) Cryptococcosis
(d) All of the above

- **Explanation:**
- **Opportunistic Fungal Infections in AIDS:**
  - Immunocompromised individuals, especially AIDS patients, are prone to opportunistic fungal infections such as:
    - **Aspergillosis:** Caused by **Aspergillus fumigatus**, leading to pulmonary infections.
    - **Histoplasmosis:** Caused by **Histoplasma capsulatum**, affecting the lungs and disseminating systemically.
    - **Cryptococcosis:** Caused by **Cryptococcus neoformans**, often leading to meningitis in AIDS patients.

Reason for Susceptibility:

- Reduced CD4+ T-cell count in AIDS impairs the immune system, making patients highly vulnerable to fungal infections.

Reference:

Medical Microbiology by Murray et al., 8th Edition, Pages 514–516.

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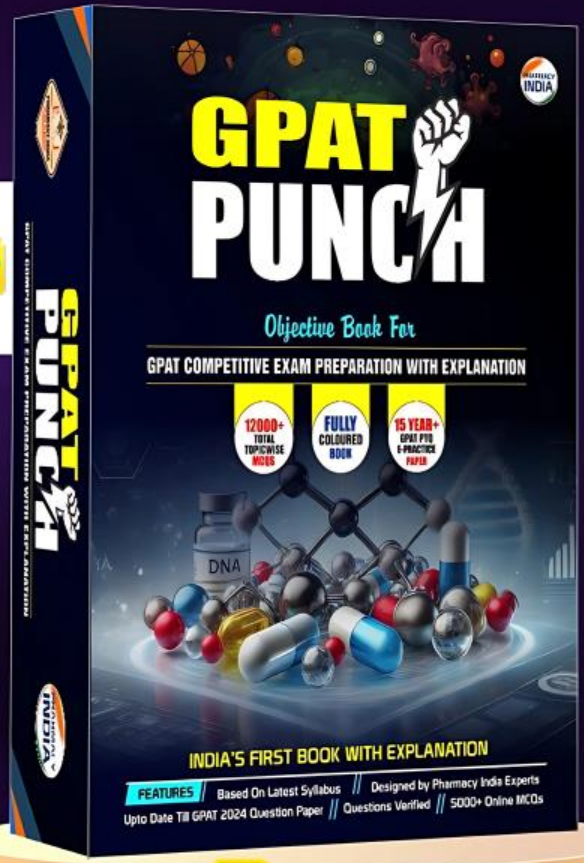

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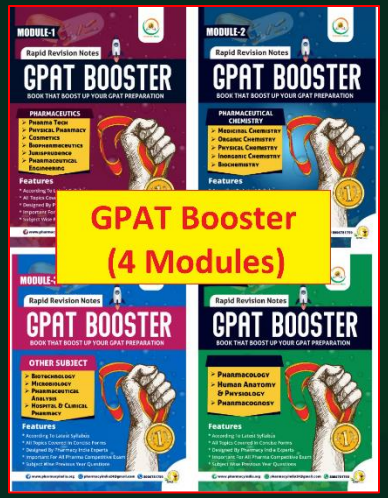

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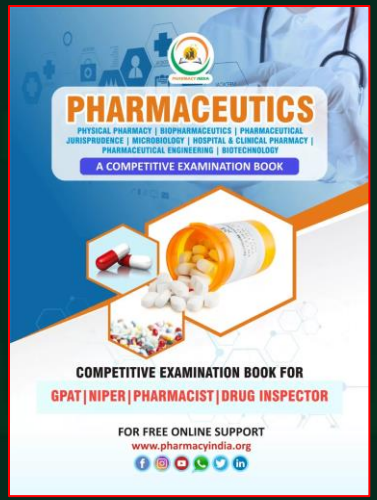

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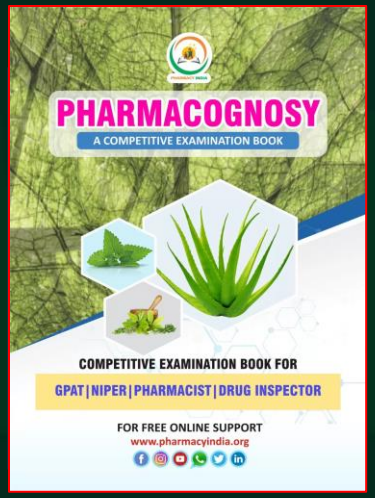

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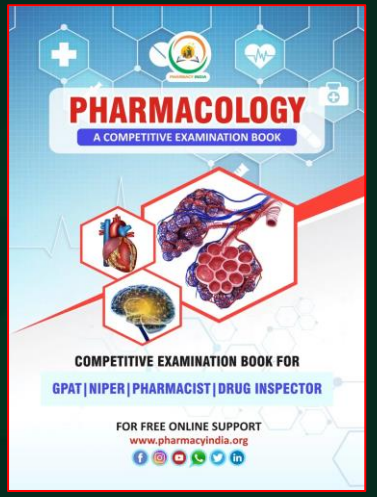

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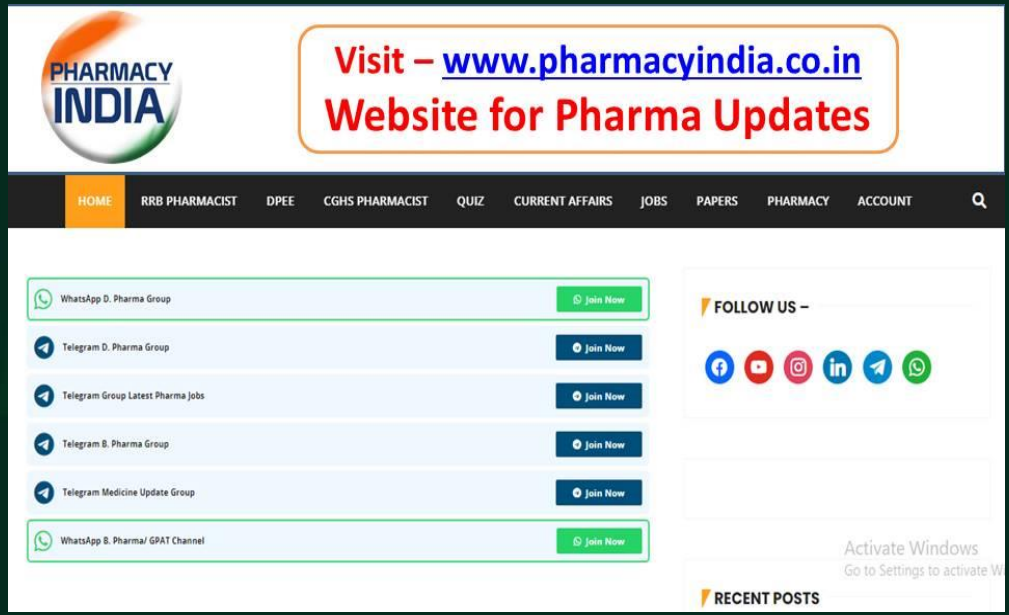

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